

Estimating the costs of compliance options for the BWC

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Estimating the costs of compliance options for the BWC

The Biological Weapons Convention (BWC) is neither in crisis nor at a crossroads, and as no state party has, to date, sought to withdraw from the convention, it can be assumed that each continues to see benefits from being within the BWC regime. Indeed, the BWC intersessional processes (ISP), which was designed to, inter alia, sustain multilateral discussion around biological disarmament following the acrimonious collapse of the protocol negotiations in 2001, have arguably exceeded expectations. Moreover, during a Special Session of the EU Non-Proliferation and Disarmament Conference in 2015, the former Pakistani Ambassador, Masood Khan who presided over the Sixth BWC Review Conference in 2006, suggested that the BWC 'is by far the most successful WMD non-proliferation and disarmament regime'.

Most successful or not, over the course of the Third ISP, a significant number of states across all regional groups have expressed an interest in strengthening the convention, a topic which has largely been avoided since 2001. Since 2012, several states—including Australia, Canada, Japan, New Zealand, Switzerland, the UK and the US—have submitted working papers referring to the 'need to talk about compliance'. In 2015, the Russian Federation proposed an 'Open-ended Working Group' to 'draft proposals to strengthen the Convention'; France, the Benelux states and several other states also appear to be pursuing peer review type mechanism to look at aspects of national implementation, and yet other states continue to maintain the position that the only sustainable means of strengthening the convention is through a multilaterally negotiated, legally binding, verification protocol.

It appears then that many states parties ostensibly support doing 'something' to strengthen the BWC; but there is no consensus on how, nor necessarily an appreciation of the financial

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costs associated with different options. Whilst biological disarmament is priceless, in times of austerity, the financial costs of options need to be considered, not least to avoid some of the sorts of shocks that befell the last review conference in 2011, when a small number of states were unable to accept a small increase in the envisaged budget for the BWC.

Compliance

Compliance with the BWC can be understood as the adherence to the obligations, both positive and negative, that states have agreed to in the process of signing and ratifying the convention. The term ‘positive obligations’ refers to those things states parties have committed to do and are relatively easy to determine by indicators, such as domestic prohibitions on biological weapons (for further examples see the UK working paper ‘We Need to Talk about Compliance: A Response to BWC/MSP/2012/WP.11’). In contrast, ‘negative obligations’ are those things that states parties have committed not to do and include activities, such as the development of biological weapons. Compliance assessment for negative obligations can be informed by a number of indicators; however, proving a negative—such as the absence of a biological weapons programme in a state—to the satisfaction of all parties is comparatively more difficult.

These obligations under the BWC are explicitly, if at points ambiguously, laid out in the text of the convention—for example, what is required under Article IV in terms of ‘prevention’ remains unclear. However, countries differ in their interpretation and (implicit) prioritisation of these obligations, with understandings changing over time in response to, *inter alia*, evolving perceptions of biological weapons risks and shifting geopolitical interests. Narrowing down differences in interpretations and agreeing a balanced package of measures is a difficult task, but one that may be important in moving forward.

What is the problem?

Compliance indicators can only ever begin to build a partial picture of whether a state is in compliance or not; with additional material required to build a more complete and accurate picture from which states can reach an informed judgment. Moreover, caution is needed in using indicators based exclusively on past programmes, if there is adequate

available information on such programmes. Future programmes may follow similar pathways to those of the past, but equally they may have different footprints, and exploit different technologies and/or facilities to very different ends. Indeed, strengthening the BWC assumes there is agreement on the nature of the problem to which the BWC is the solution in the twenty-first century, and this may not be the case. Perhaps wrongly, today’s view is that negotiations on the BWC emerged as a response to concerns over large-scale, overt biological weapons use. However, biological weapons have a number of utilities ranging from mass destruction, to small-scale incapacitation and economic sabotage; they can be used overtly or covertly against humans, animals and plants by states, non-state organisations and indeed lone actors. How one sees the problem of biological weapons has a considerable bearing on whether strengthening the BWC is worth it and, if so, what a strengthened BWC would look like.

Options for compliance

The existence of different priorities and visions suggests it may be useful to consider a range of options for strengthening the BWC. What follows is a menu of compliance-related options that could be considered separately—or in combination—either instead of, or additional to, a future ISP. As with any menu, there are costs associated with each option. In this article, they are largely presented in the form of an estimate of conference servicing costs, based on those figures outlined in the official 2011 document on the (revised) *Estimated costs of the intersessional programme of the Convention to be held from 2012-2015*. Such estimations serve only as an indicator of a fraction of the total costs which remains unadjusted for inflation, yet it remains a fraction that can be reasonably anticipated. This does however exclude, for example, the costs associated with implementation support, travel and accommodation, and funding for informal meetings. Also excluded are ‘invisible’ costs such as *time* for preparing and producing working papers, a cost which is unlikely to be evenly shared; *political costs* that may be borne in the pursuit of any specific option; and potential (missed) *opportunity costs* incurred in the selection of any particular option over another.

Option 1: maintaining the status quo

One option is for states parties to maintain the *status quo* and agree a fourth ISP devoid of any discussion on compliance.

Failure to include compliance would not necessarily undermine the norm against biological weapons, nor collapse the convention. Neither would it affect the continuation of exogenous activities that could reinforce the BWC, such as ongoing efforts to revitalise the UN Secretary General's Investigatory Mechanism; efforts to improve Global Health Security; explorations of peer review; or measures to improve laboratory management, such as ISO 35001 on *Laboratory biorisk management systems*, which is envisaged as including certifiable internationally agreed standards for laboratory management. As such, continuing with the status quo—at an estimated cost of \$610,000 per annum for the conference servicing of two annual meetings—would not worsen the situation. However, it is questionable whether this is the best use of states' time and resources and unclear what this means for the sustainability of interest in the BWC.

Option 2: compliance reporting and clarification

A second option is for states parties to submit background materials on their national compliance. Such an activity is one of the underlying reasons for the Confidence Building Measure (CBM), including Form E, which obligates states to annually account for national legislation, regulations and other measures. It also has precedent in, inter alia, the reports submitted by Canada, the Czech Republic and Switzerland (the 'National Implementation of the BTWC: compliance assessment: update') in 2012, and the national compliance reports that have been submitted to Review Conferences since 1980. In 2011, 36 states submitted such reports with contributions averaging about three and a half pages and divided between an article-by-article approach and a thematic approach. The cost of these reports will primarily be borne in officials' time and will depend on the extent of materials already available.

Thus far, any issues arising from compliance reports have seemingly been dealt with on a bilateral basis. However, if compliance reports are considered useful—or could potentially be strengthened, standardised and/or submitted annually—then there may be value in allocating time for discussion and clarification of any issues that may arise. Thus states parties could consider allocating a three-hour session in a future provisional programme of work to a closed session mandated to review and discuss compliance reports.

Based on the estimated conference servicing costs for the third ISP, a single three-hour session would entail an annual cost of \$34,210. If unused, the session could be reallocated for other activities.

Option 3: standing agenda item on compliance

Another minimalist option could be agreement to a standing agenda item on compliance at the BWC's Eighth Review Conference in late 2016. In circumstances where there is ambiguity around certain obligations, 'discussion, and promotion of common understanding and effective action' could be useful to narrow down differences in interpretations and potentially lay the foundations for future work. Standing agenda items have typically been dealt with annually through two sessions at the Meetings of Experts in the summer and one subsequent session of the Meeting of States Parties in the winter.

Based on the estimated conference servicing costing for the third ISP, a standing agenda item on compliance can be costed at \$95,210 per annum.

Option 4: Peer Review option

A further activity that could facilitate progress in compliance is peer review or some other form of systematic examination of the performance of a state in a selected area undertaken by other states. There are several variants on the peer review concept that have been explored, as evidenced in the work of France and, subsequently, the Benelux countries. In addition to these, it was announced in the 2015 Meeting of States Parties that three other states—Germany, US and Canada—appear to be following suite with some form of peer review type activity. These models differ in the extent they directly relate to compliance: the French model explored best practices in areas of biosafety, biosecurity and export controls, whereas the Benelux model focused on biodefence and national legislation and included both documentary assessment and visits to facilities.

Peer review is no substitute for verification, but nor is it currently a distraction as it provides a greater understanding of the processes through which compliance could be demonstrated, as well as encouraging scrutiny over national activities and sharing of lessons learned and better practices. Moreover, it is a flexible tool that can be applied to a number of other

BWC obligations, including, potentially, better practices in assistance and international cooperation (see for example OECD's Development Assistance Committee Peer Reviews <http://www.oecd.org/dac/peer-reviews/>).

The costs of peer review will depend upon the scope and duration of the exercise; however, as a guide, the French peer review process cost \$31,959 inclusive of travel, accommodation, subsistence and the production of the report. With the Benelux model, costs were primarily borne in terms of officials' time.

Option 5: VEREX 2.0

Science and technology (S&T) of relevance to assessing compliance has changed considerably since the work of the Ad Hoc Group of Governmental Experts to Identify and Examine Potential Verification Measures from a Scientific and Technical Standpoint (VEREX) in the early 1990s. Indeed, the VEREX report acknowledged some of the measures assessed as being limited by availability and 'stages of development'; and whilst the central conclusions of VEREX may still hold true in that some 'measures would contribute to strengthening the effectiveness' of the BWC, advances in S&T since 1994 will have almost certainly effected evaluations of the 21 verification measures identified and potentially created a number of new tools. Furthermore, there has been a significant shift in risk perceptions that such a group could usefully explore to provide a solid technical foundation for political discussion.

As such, there could be merit to revisiting the S&T of relevance to compliance, taking into account developments in technologies such as biosensors and satellites; new online sources and means of information monitoring; new practices in the life sciences that could enhance or undermine efforts to strengthen the convention; and new knowledge from past programmes. As in the past, such a suggestion is likely to inflame political sensitivities. It will also require financial support and time, particularly from technical experts. The VEREX group, for example, produced 176 working papers and 84 non-papers.

VEREX met four times between 1992 and 1993, each time for two working weeks. Using estimated conference servicing costs for the third ISP, an equivalent set of expert meetings can be estimated at \$1,368,400 per year. In addition there would be considerable time costs in updating background

materials, something that could be aided by international scientific organisations undertaking technical discussion outside of the main conference room, thereby eliciting greater scientific debate.

Option 6: open-ending working group

The concept of an open-ended working group (OEWG) has precedent in a number of other agreements, such as the Chemical Weapons Convention and the Comprehensive Nuclear-Test-Ban Treaty. In the BWC context, in 2011, Australia, Japan and New Zealand submitted a 'Proposal for a working group to address compliance issues', which sought to establish an OEWG on compliance, with meetings suggested as forming part of an annual Meetings of Experts to 'discuss and develop common understandings on issues relevant to enhancing assurance of compliance with the BWC'. The proposal focused on two key questions: what constitutes compliance and how can this be demonstrated? As such, it offered one useful route into both conceptual and practical discussion on compliance. However, the proposal failed to gain significant traction in 2011.

In 2015, the Russian Federation proposed the establishment of an OEWG 'to elaborate on a basis of consensus appropriate measures and draft proposals to strengthen the convention to be included, as appropriate, in a legally binding instrument' as language for inclusion in the report of the Eighth Review conference. The proposal envisages work in a number of areas including, inter alia, transparency, national implementation, monitoring S&T, strengthening international cooperation, and a mechanism for assistance and protection against biological weapons in the event of violation of the convention. As such, the Russian proposal arguably provides a broad package of measures that may appeal to cross-regional groups and potentially stimulate higher-level interest in the BWC. It is, however, unclear whether this proposal will garner sufficient support: by avoiding reference to verification, some will see this as too modest; by proposing a return to negotiations, yet others will see this as a potentially muddy road to nowhere.

Moreover, the proposed Russian OEWG may be more expensive with a number of meetings likely to be needed to reach consensus on the broad range of issues identified, particularly if the objective is achieving a legally binding agreement. As such, the best indicator of costing perhaps remains

the work of the Ad Hoc Group (AHG), which worked towards the development of a Protocol to the BWC over the course of the mid to late 1990s, and which can be estimated as costing \$3,245,062 per annum for conference servicing, based on 2011 prices (see below).

Option 7: the Protocol

For many states, a multilaterally negotiated, legally binding, verification protocol is the only sustainable means of strengthening the convention. Some form of verification remains a 'gold standard' for disarmament agreements and something to continue to aspire to, not least, as this would provide the BWC with 'teeth', presumably in the form of some mechanism for monitoring, assessment and evaluation of compliance.

However, even if some form of verification were technically feasible, returning to the protocol will be politically divisive, time consuming and expensive. The 24 sessions of the AHG conducted between January 1995 and August 2001 officially consisted of 332 working days of meetings in Geneva. Based on current estimated costs of a five-day Meeting of Experts, an equivalent set of meetings would now amount to a total of \$22,715,440, or \$3,245,062 per year. This estimate excludes the cost of travel, accommodation and time allotted to the production of working papers, of which there was a total of 455 published.

If successful, such a figure is perhaps a small price to pay for a BWC verification system, but were efforts to fail again, it would be an extremely expensive failure on many levels. Of course negotiations on some form of protocol could proceed much quicker than past efforts, facilitated by elements of the work of the AHG that may retain relevance (as well as aspects of work in the ISP). Yet it is also likely that much of the work

of the AHG would need both re-doing to account for technical changes and/or evolving perceptions of security since 2001, and re-learning because of the lack of institutional memory. All of this makes the protocol an ambitious yet high-risk option.

Reflections

The value of effective, sustained biological disarmament—undertaken in a manner that encourages peaceful cooperation—is priceless. However, achieving this will entail financial and political costs, and the choice of any one route towards strengthening the convention over another may entail opportunity costs. None of these costs can be realistically predicted in advance; but if there is appetite to do something towards strengthening the convention in a time of austerity, then financial costs cannot be ignored.

This note has provided a crude estimate of option costs based on the conference service costs as presented in BWC/CONF. VII/4/Rev.1 for the third ISP. As noted earlier, these estimated costs are *not* a comprehensive estimate of all financial costs that can be associated with any particular option; nor do they take into account the cost of the three-person Implementation Support Unit (ISU), which may need to be expanded should states wish to undertake more ambitious activities. Deciding whether any of these options—or combinations of options—is worth it will depend on whether states parties are sufficiently concerned to act; and, if so, how far they are willing and able to agree to provide political will and financial support to strengthening the convention by developing a system in which the benefits of participation in biological disarmament ever more outweigh the costs of not participating.*

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Option	Estimated financial cost
Status Quo	\$610,000 per annum
Clarification Session	\$34,210 per annum
SAI Compliance	\$95,210 per annum
Peer Review	\$31,959 travel & report
VEREX 2.0	\$1,368,400 per annum
OEWG	\$3,245,062 per annum
The Protocol	\$3,245,062 per annum



Verification Watch

Progress investigating chemical weapons use in Syria

Giuseppe Di Luccia, London

From 30 November to 4 December 2015, the annual Conference of the States Parties (CSP) to the Chemical Weapons Convention (CWC) met in The Hague. Responding to the latest reports from the Organisation for the Prohibition of Chemical Weapons (OPCW) Fact-Finding Mission (FFM), representatives of states parties and other participating organisations—such as the International Committee of the Red Cross—discussed the situation in Syria. While commending the work of the FFM in establishing the facts behind the allegations and of the OPCW-UN Joint Investigation Mechanism (JIM) in identifying those responsible, state parties continued to raise concerns over the use of chemical weapons in Syria. As a result of the FFM's three reports, the CSP established a special fund for the OPCW special missions in order to meet the costs arising from such 'unforeseen activities'.

The FFM's three latest reports, issued on 29 October 2015, made conclusions on the use of chemical weapons with varying degrees of confidence in two of the three reports. The first report covered the investigation of multiple alleged incidents of chemical weapons use in the Idlib province of Syria, in the period between March and May 2015. Despite the inability of the team to visit the location due to the complex security conditions in the country, the investigation nevertheless confirmed that the use of one or more chemicals—probably chlorine—as a weapon was 'likely' in the incident in Sarmin, a village within Idlib province. The use of these chemicals as weapons resulted in the deaths of six people, all from the same family.

The second report confirmed, 'with utmost confidence', that at least two people were exposed in the city of Marea to sul-

fur mustard, a blister agent (also known as a vesicant) that burns the skin or other parts of the body. The report also added that the death of an infant was 'very likely' due to similar exposure. In this case, the team was able to interview the casualties fairly quickly after the events took place and witnessed the collection of biomedical samples, thereby improving the credibility of the test results.

The third report was circulated on 29 October 2015, following the Syrian government's allegations of an attack against its soldiers in Jobar. In this interim report, the OPCW's FFM stated that it 'cannot confidently determine whether or not a chemical was used as a weapon.'

The establishment of the FFM, announced by the OPCW-Director General Ahmet Üzümcü on 29 April 2014, provided a mandate restricted to the verification of the allegations concerning the use of chemical weapons in Syria, without attributing such acts to any party. The FFM confirmed the use of chemical weapons in June and September 2014, but so far the UN Security Council has not been able to agree on referring the situation in Syria to the International Criminal Court. If they had, then this would have set about procedures that could establish accountability. The UN Security Council was, however, able to unanimously agree on resolution 2235 on 7 August 2015, which establishes the one-year Joint Investigative Mechanism. This joint body between the UN and the OPCW has been tasked with identifying 'individuals, entities, groups, or governments involved in the use of



The OPCW Headquarters in The Hague. Image: Roel Wijnants

chemicals as weapons, including chlorine or any other toxic chemical.'

The JIM became fully operational on 13 November 2015 under the leadership of Virginia Gamba, Director of the Office of Disarmament Affairs and Deputy to the High Representative for Disarmament Affairs for the UN. Ms Gamba is the head of a 3-person Leadership Panel, and has a staff composed of 24 professionals selected for their high degree of expertise and varied geographic origins.

As the UN's acting High Representative for Disarmament, Kim Won-soo explained to the Security Council on 2 December, that the joint body had begun its work collecting information from the OPCW's database and analysing the reports submitted by the FFM. Pursuant to resolution 2235, the first report will be presented to the UNSC within 90 days of the date on which the JIM became operational, which will be on 13 February 2016. On 11 December, the UN and the Syrian government signed an agreement in New York that will enable the JIM expert team to conduct its activities with the support of local authorities. It remains to be seen whether the unstable internal situation will allow this mission to be accomplished. •

Paris Agreement: a new global action plan to tackle climate change?

Joy Hyvarinen, London

The UN Paris climate change conference concluded on 12 December 2015 with the adoption of a new legally binding climate change treaty, known as the Paris Agreement. The new agreement is the outcome of negotiations that started in 2011, in recognition that stronger efforts to reduce greenhouse gas emissions are needed to limit global temperature increases and to manage the risks of climate change.

The Paris Agreement has been widely welcomed, though some have pointed to the absence of binding targets as a weakness. The hope is that, under the new agreement, countries will submit increasingly ambitious plans to com-

bat climate change, which, taken together, will limit the global average temperature increase to well below 2°C, possibly even 1.5°C. Countries are expected to submit such plans at five-year intervals; each successive plan is meant to represent a progression when compared with the previous one.

Countries such as the US, China and India were able to agree to the adoption of the Paris Agreement, which many have highlighted as one of its most important achievements. In the past, differences in view between developing and developed countries about their respective contributions to combating climate change in the future have been an obstacle to reaching agreement in the international negotiations—with the US, China and India among those playing a prominent role in the discussions.

The 1992 UN Framework Convention on Climate Change (UNFCCC) recognised developed countries' historical responsibility for climate change and required them to take the lead in combating it. With the growth in greenhouse gas emissions in developing countries since then, developed countries have argued that the UNFCCC's strict distinction between developing and developed countries should no longer apply.

The Paris Agreement softens this distinction considerably. The agreement recognises differences between developing and developed countries, but contains common rules. For example, all countries, not just developed countries, are required to prepare and submit climate plans (referred to as 'nationally determined contributions') that publicly outline what post-2020 climate action they intend to take.

The common rules in the agreement include what is referred to as an 'enhanced transparency framework', but this also recognises differences between developing and developed countries. The rules of the enhanced transparency framework contained in the Paris Agreement require each country that joins the agreement to provide a national inventory report and information necessary to track progress on its climate plan. Countries are also expected to provide

information on support provided or received in the areas of finance, technology transfer and capacity-building.

In addition, the Paris conference adopted a decision that accompanies the new agreement. The decision includes a new Capacity-building Initiative that is specifically focused on supporting developing countries to meet the enhanced transparency requirements under the Paris Agreement. The capacity-building initiative will aim to strengthen national institutions; provide tools, training and assistance; and assist in the improvement of transparency over time.

According to the agreement, the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement shall, at its first session, adopt common modalities, procedures and guidelines for the transparency framework. The decision that accompanies the Paris Agreement requests the ad hoc working group that will prepare for entry into force

of the agreement to develop recommendations regarding this.

The Paris Agreement is meant to come into effect and be implemented from 2020—this assumes that enough countries join to bring the agreement into force by then. This allows time for preparatory work, such as elaborating the modalities, procedures and guidelines for the transparency framework. This will be an important task for the Ad Hoc Working Group on the Paris Agreement. A well-functioning transparency framework will make it possible to monitor progress and compare efforts among countries, and it will help to build trust. •



A photo of the Twenty-First Session of the UN Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP21) and the Eleventh Session of the Meeting of the Parties to the Kyoto Protocol (CMP 11). Image credit: United Nations



Implementation Watch

'Hiroshima on a light switch' condemned in US court

Giuseppe Di Luccia, London

In August 2015, Mr Glendon Scott Crawford was convicted by a jury in the US for his attempt to produce and use a radiological dispersal device. Mr Crawford is the first person convicted for producing and using such a device under Title VI, Subtitle J of the US Intelligence Reform and Terrorism Prevention Act (Prevention of Terrorist Access to Destructive Weapons Act of 2004).

The 51-year-old industrial mechanic from Galway, New York, created a remote initiation device that could activate a commercially available X-ray machine that he acquired to expose his targets, Muslim communities in the state of New York, to radiation. A key point of his plan was for the victims to be initially unaware of the radiation exposure, as symptoms would only appear days later. This would help maximise the damage caused by the device. With help from accomplice Mr Eric J. Feight, Mr Crawford managed to build and test the remote initiation device, which was powered by an electrical source for a plug-in cigarette lighter. He called the weaponised device 'Hiroshima on a light switch.'

However, Mr Crawford acquired the X-ray machine from an undercover FBI agent, who had made the X-ray machine ineffective. A 14-month investigation involving two FBI field offices and numerous undercover agents engaged in recording secret meetings, phone calls, text messages and e-mails was launched in April 2012—resulting in three charges against the defendant. Mr Crawford was ultimately convicted of attempted production and use of a radiological dispersal device in violation of Title 18 of the United States Code section 2332h(a) and (c)(1); conspiracy to use a weapon of mass destruction under section 2332a(a)(2)(c); and distribution of information relating to weapons of mass destruction under section 842(p)(2)(a).

Mr Crawford is scheduled to be sentenced on 16 March 2016. He faces at least 25 years of imprisonment on the first count, up to life imprisonment on the first and second counts, and up to 20 years on the third count.

While the third count is based on prohibitions introduced to the US Code before 9/11, the first and the second counts stem from the violation of provisions included in the US

Code in the aftermath of the attacks. The 2004 Intelligence Reform and Terrorism Prevention Act aimed at the unification and coordination of the US intelligence and law enforcement agencies against terrorism. More specifically, in response to the widespread fear of use of radiological weapons by non-state actors, this 235-page Act included the Prevention of Terrorist Access to Destructive Weapons Act of 2004, which amended the US Code by adding section 2332h (the first count against Mr Crawford). Likewise, the Intelligence Reform and Terrorism Prevention Act, through the Weapons of Mass Destruction Prohibition Improvement Act of 2004, amended section 2332a (the second count against Mr Crawford) which was originally introduced by the Violent Crime Control and Law Enforcement Act of 1994.

Furthermore, the 2005 International Convention for the Suppression of Acts of Nuclear Terrorism (ICSANT) requires states parties to criminalise and penalise acts that use radioactive material to cause harm. The US signed the agreement on 14 September 2005. On 2 June 2015, the Senate passed implementing legislation for ICSANT and approved ratification of the Convention, ready for the recent ratification on 30 September 2015.

While section 2332h enables prosecution and conviction for the possession of a device designed to release radiation with the intent to cause death or serious bodily injury, the implementing legislation for ICSANT creates new criminal offenses regarding the possession and the use not only of radiation-emitting devices, but also of radioactive material. Furthermore, it criminalises attempts, threats, and conspiracies to commit these offenses. Section 2332i also adds new grounds for jurisdiction, new definitions and cases in which the provisions do not apply, namely 'activities of armed forces during an armed conflict and activities undertaken by military forces of a state in the exercise of their official duties.'

The availability of radiological dispersal devices and radiological materials by non-state actors poses a serious challenge to international and national security. States focus their efforts on initiatives that provide the greatest potential for protecting their citizens from radiological attacks. Among them the provisions contained in Title 18 of the US Code, as amended in compliance with the obligations contained in ICSANT, reinforce the prevention and prosecution of crimes that involve the possession and the use of radiological weapons. •



Noble gas detection for CTBT monitoring

David Keir, Oslo

On 6 January 2016, the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) announced that its International Monitoring System (IMS) had detected 'unusual seismic activity in the Korean peninsula'. The Democratic People's Republic of Korea (DPRK) claimed this was the country's fourth nuclear test.

The reaction of the international community to the alleged nuclear test has once again underscored the need to maintain effective monitoring and detection systems for such explosions. The earliest signs of an underground nuclear test tend to be identified through seismic monitoring. However, the detection of radionuclides, and in particular of radiosotopes of xenon, can supply the 'smoking gun' that can conclusively confirm whether a detected seismic event is of nuclear origin. In April 2013, the Preparatory Commission for the CTBTO stated that detection of radionuclides can provide 'clear evidence' of a nuclear explosion. This point was then highlighted during the latest meeting of the International Noble Gas Experiment (INGE), held in Austin, Texas, in December 2015. This experiment has been blazing a trail for over a decade in the use of xenon to detect underground nuclear explosions.

The isotopes of xenon of interest here—xenon-131m, xenon-133, xenon-133m, xenon-135—are produced during the nuclear fission of uranium-235 when a nuclear explosive device is detonated. Unlike many of the other resulting radioisotopes, xenon is chemically inert and so (because it does not bond chemically to the underground surfaces of rock and soil in a buried test explosion) it will eventually seep out into the open air.

The Comprehensive Nuclear-Test-Ban Treaty (CTBT) al-

ways foresaw the development of a network of noble gas systems intended to measure radioactive xenon. However, at the time when the IMS began to be developed in the early 2000s, no such technology existed. Four national teams were working on the method, but there was no consensus on the details of how to collect and measure xenon during or after an underground explosion.

In 1999, personnel of the Provisional Technical Secretariat (PTS) of the CTBTO came up with the idea of an international experiment in which different analytical methods could be compared and then prototype equipment could gradually be developed, tested and moved onto the next stage, in which CTBT monitoring operators could use it. This was the genesis of the INGE.

In the first stage, inventors and developers from France, Russia, Sweden and the United States held collegial scientific debates where concepts were compared, and leaps forward in collection and measurement capability were made. This led to the production of four different prototype systems for detecting radioxenon. As the various systems were made available for testing by independent operators from across the world, a broader group of experts was formed. These scientists and engineers created software to analyse levels of xenon isotopes detected at specific geographical locations at specific times and dates, and then created databases to tabulate and store great volumes of results. A definite breakthrough occurred when the group began to use sophisticated atmospheric backtracking, via computer models, to home in on the geographical point of origin of xenon releases.

Like other scientific collaborations, INGE members have published papers on all aspects of their experiments, from theories to hardware, to global analysis of background radioactivity. A major thread in these publications has been how to discriminate signals of nuclear explosive debris from

the emissions of xenon from legitimate civilian nuclear activity.

Since the INGE has been in operation, there have been a number of important events that have put the detection of radioxenon to the test. These include the three nuclear tests that were announced by the DPRK in 2006, 2009 and 2013—the latter two of which were detected by IMS xenon systems. The Fukushima reactor releases in March 2011 provided another stress test for these systems and their calibration. Investigating the DPRK's alleged fourth nuclear test will provide another trial for the systems and their capacity.

The job of developing noble gas detection for CTBT monitoring is not over yet. Customising xenon equipment for on site inspection (OSI), global background radioactivity studies, and other challenges have come into focus just in the last couple of years. One particular interesting area for further consideration is the use of argon, specifically argon-37, detection in OSI activities. This isotope is made when neutrons strike calcium atoms in the rocks and minerals underground, and presents a completely independent signature of a nuclear explosion.

Another issue of concern is that the original prototype equipment is getting old. At present, all four original national developers are working on next generation equipment. This new equipment will have attributes like delivering more xenon per unit of electrical power, use fewer consumables, and be easier for the PTS to maintain in far-flung locations. •

Breaking News: DPRK announces fourth test

On January 6, 2016, the Vienna-based Preparatory Commission for the Comprehensive Test Ban Treaty Organisation (CTBTO) reported on 'unusual seismic activity in the Korean peninsula'. The DPRK state-run news agency, KCNA, has issued an official announcement claiming this was the country's first test of a Hydrogen bomb. The CTBTO has announced that its experts are analysing the data they possess, and will provide information to the public through a dedicated webpage.

VERTIC's analysis of CTBT verification: <http://bit.ly/1kMEkp6>

Programme News

Verification and Monitoring Programme

During this quarter, the Verification and Monitoring (VM) team worked on and then launched VERTIC's latest publication under its project on multilateral verification of disarmament, *Verification Matters No. 12: Exploring multilateral verification of nuclear disarmament: scenarios, modelling and simulations*. This major publication discusses progress on an ambitious methodology, with several useful applications, under development over the past years of research by VERTIC.

In addition, the team has continued to carry out and review surveys on countries' national approaches to the implementation of IAEA nuclear safeguards. We have also been busy preparing for two Technical Assistance Visits on nuclear non-proliferation and IAEA safeguards, to be conducted in January 2016 in Africa.

On 10-13 November 2015, Researcher Alberto Muti took part in the 6th annual meeting of the Asia-Pacific Safeguards Network, held in Tokyo, Japan. During the meeting, Mr. Muti presented on VERTIC's work on safeguards implementation, and on the database of national implementation approaches that VERTIC is using to inform and support its assistance to countries.

On 16 November, Executive Director Andreas Persbo presented on progress made under VERTIC's project on multilateral disarmament verification to the International Partnership for Nuclear Disarmament Verification plenary meeting in Oslo, Norway. Principal Scientist David Keir also participated in meeting activities.

The VM team has also continued to engage on VERTIC's project on a UK-China scholarly dialogue on verification in the security field, after its successful September meeting.

This quarter also saw VERTIC work on guidance and

monitoring on Reducing Emissions from Deforestation and Degradation (REDD), and establish cooperation with the Sustainable Tropics Alliance. The Sustainable Tropics Alliance is a strategic partnership of leading independent non-governmental organisations working at the local, national and global level to develop new approaches to low-emission rural development in the tropics. Within the alliance, VERTIC focuses on verification, implementation and monitoring, mainly in the areas of climate change and sustainable development, including how international frameworks can support transitions to low emission rural development and how on-the-ground experience can inform international processes.

The team was also heavily involved in finalising and launching VERTIC's new serial publication *Verification & Implementation*, which brings together leading practitioners and experts from the field to explain, appraise and propose ideas for strengthening the verification and implementation of international agreements and treaties. For more information, see the publication news on this issue of *Trust & Verify*. •

National Implementation Programme

During this quarter, the NIM team completed one legislation survey on the implementation of international instruments for nuclear security, three legislation surveys on the implementation of the Biological Weapons Convention (BWC) and one legislation survey on the implementation of the Chemical Weapons Convention (CWC). In addition, the team sent universality packages to three African states: two for adherence to the BWC, and one for adherence to the Amendment to the Convention on the Physical Protection of Nuclear Material and the International Convention for the Suppression of Acts of Nuclear Terrorism.

On 8-9 October, Senior Legal Officer Sonia Drobysz participated in a workshop on the National Chemical, Biological, Radiological and Nuclear (CBRN) Strategy and National Action Plan of the Republic of Moldova in Chisinau, with experts from the European Union, UNICRI, the OSCE, UNODA and the 1540 Committee Group of Experts. She presented on 'Strengthening the implementation of UNSCR 1540 and related CBRN instruments in Moldova'.

On 14-16 October, NIM Programme Director Scott Spence attended the Wilton Park conference on 'The Australia

Group: challenges and future directions'. The following week, from 20-22 October, Sonia and Senior Legal Officer Yasemin Balci travelled to Dakar, Senegal, to assist the national commission on nuclear, biological and chemical weapons in drafting a bill for the implementation of the BWC.

Scott was also in Africa on 29-30 October, to participate in a workshop on the universalisation of the BWC in Africa in Addis Ababa, Ethiopia, organised by the Commission of the African Union and the BWC Implementation Support Unit. He presented on the national implementation of the BWC and on VERTIC's legislative assistance to implement CBRN international instruments.

On 19-20 November, Sonia was in Cologne, Germany, for a conference on 'Legal Issues of Peaceful Uses of Nuclear Energy' organised by the International Law Association's Committee on Nuclear Weapons, Non-Proliferation and Contemporary International Law. She gave a presentation on 'A framework for the secure development of nuclear energy: obligations and challenges'.

On 23-24 November, Scott went to Dhaka to work with the Government of Bangladesh in drafting a BWC bill. Shortly after, he travelled to El Salvador on 30 November to 1 December to participate in the 37th Annual Parliamentary Forum on the role of parliamentarians in support of peace and security, with a focus on the Arms Trade Treaty and the BWC. Scott presented on the national implementation of the BWC.

On 9-10 December, Scott took part in the 3rd Myanmar-US/UK Nonproliferation Dialogue in Yangon, Myanmar, and presented on the national implementation measures for the CWC and UN Security Council Resolution 1540. Scott also took part in the first and second of these dialogues in 2013 and 2014.

From 14-18 December, Scott represented VERTIC at the BWC Meeting of States Parties in Geneva and gave the charity's statement to plenary. This is the last of such meetings during the 2012-2015 intersessional process before next year's Eighth Review Conference. •

Publications News

On 16 November 2015, VERTIC published *Verification Matters No. 12: Exploring multilateral verification of nuclear disarmament: scenarios, modelling and simulations*. The report provides a guide for developing simulation exercises to consider the technical, legal and political challenges involved in verifying nuclear disarmament. It explains how creating nuclear disarmament ‘scenarios’ and technical models of nuclear programmes can provide detailed and comprehensive environments in which to run these simulations. It also discusses questions that need to be addressed while exploring disarmament verification options to ensure that any proposed solutions are reliable, coherent, trusted and accessible.

The report was prepared by Hugh Chalmers, David Keir, Larry MacFaul, Russell Moul, and Alberto Muti, with the contribution of VERTIC Executive Director Andreas Persbo and Deputy Executive Director Angela Woodward through VERTIC’s project on multilateral verification of nuclear disarmament, supported by the Norwegian Ministry of Foreign Affairs.

Verification Matters No. 12 is available on the VERTIC

website in PDF and e-reader formats.

On 16 December 2015, VERTIC launched *Verification & Implementation*, a biennial publication that brings together leading practitioners and experts from the field to explain, appraise and propose ideas for strengthening the verification and implementation of international agreements and treaties.

As the preface to the publication says: ‘the implementation and verification of these arrangements builds confidence and know-how, allowing the international community to work cooperatively toward mutual goals. Informed and innovative approaches to verification and implementation that draw on technical, legal, political and economic insights will help to strengthen and sustain this framework.

Nurturing a wide range of technical, legal, political and economic tools will help the international community support cooperative approaches to shared security challenges. Tackling these challenges requires a sound appreciation of the interests of governments and other stakeholders, and how they interact with one another. It requires identifying the approaches that worked in the past and those that did not, and how verification and implementation systems should evolve to remain efficient and effective. Assistance must be made available to governments and other stakehold-



ers who might otherwise struggle to participate in collective approaches to security to the extent they would like.

These issues are being addressed by a wide and multidisciplinary community of organisations and individuals committed to finding ways of galvanising and sustaining purposeful collective action toward a more peaceful and productive future. In this context, VERTIC is re-launching its book series focusing on international agreements for global security and development. *Verification and Implementation* presents an accessible set of essays, authored by leading practitioners and experts from the community that explain and analyse the verification and national implementation mechanisms that make international arrangements work in practice. The essays also throw light on how emerging developments in technology, industry, business and society around the world may impact this field, both in terms of new risks to international agreements and new opportunities to strengthen them. While the essays contained in the publication typically take an interdisciplinary approach to their subjects, some turn their focus toward one particular perspective—be it legal, political, or technical.

Readers of this publication will find practical analysis that can assist them in addressing or researching current challenges faced by the international community.

The first edition of Verification & Implementation can be found on the VERTIC website in both PDF and e-reader formats.

A launch event took place on the same day in London and included a discussion of the volume by Acting Programme Director and Editor-in-Chief Larry MacFaul and Executive Director Andreas Persbo, as well as a presentation from Mark Hibbs, Senior Associate in the Nuclear Policy Programme at the Carnegie Endowment for International Peace, on his chapter ‘Iran and the Evolution of Safeguards’.

Hard copies are also available. For more information contact larry.macfaul@vertic.org

Verification and Implementation chapters include:

Foreword

Ambassador Ahmet Üzümcü, Director-General, OPCW

Iran and the Evolution of Safeguards

Mark Hibbs, Senior Associate, Carnegie Endowment

Securing the Front End of Iran’s Fuel Cycle

Andreas Persbo, Executive Director, VERTIC

Hugh Chalmers, Senior Researcher, VERTIC

In Defence of the Evolution of IAEA Safeguards

Craig Everton, Director, Australian Safeguards and Non-Proliferation Office

The Role of Organisations Culture in Effectively Implementing Safety, Security, and Safeguards in New Nuclear Power Countries

Donald Kovacic, Nuclear Engineer, Oak Ridge National Laboratory

Investigating Multilateral Verification of Nuclear Disarmament: Fuel Cycle Modelling for Simulations

David Keir, Principal Scientist, VERTIC

Russell Moul, Researcher, VERTIC

Dealing with Objections to the CTBT

Edward Ifft, Adjunct Professor, School of Foreign Services at Georgetown University, former US State Department

Chemical Demilitarisation in Syria: An Overview

Dominique Anelli, Head of Chemical Demilitarisation Branch, OPCW

Mehran Rouzbhani, Team Leader, OPCW Inspectorate Division

Biological Weapons Convention Implementing Legislation and Compliance

Angela Woodward, Deputy Executive Director, VERTIC

The Arms Trade Treaty: Making a Difference

Jo Adamson OBE, UK Ambassador to Mali

Guy Pollard MBE, UK Deputy Permanent Representative to the Conference on Disarmament in Geneva

Fundamentals of Cyber Security

Dave Clemente, Senior Research Analyst, International Security Forum

In memoriam

Angela Woodward, Christchurch

VERTIC staff and trustees sadly note the passing of former VERTIC trustee John Edmonds, CVO CMG, on 17 August 2015, aged 94. John had an illustrious career spanning service in the Royal Navy during and after the Second World War, and successive posts at the Foreign Office, as it was then called, which he joined in 1959.

In 1974, he was appointed to head the Foreign Office's Arms Control and Disarmament Department and was then named Managing Director of the nascent Nuclear Suppliers Group (NSG), which was set up in 1975 and administered by the Foreign and Commonwealth Office. The NSG was a rare instance of foreign policy convergence by the five nuclear-weapon states during the Cold War.

In 1975, he was on the delegation to the First Review Conference of the Nuclear Nonproliferation Treaty (NPT), and later led the UK delegation to the trilateral CTBT negotiations from 1978, when he was appointed a personal rank of ambassador until 1981. By this time the negotiations were fruitless, largely due to the discord between the US and Soviet Union over the latter's invasion of Afghanistan in 1979. Following his retirement from diplomatic service in 1981, John lectured and wrote on arms control, often alongside fellow longstanding VERTIC trustee, General Sir Hugh Beach.

John was a member of VERTIC's Oversight and Advisory Board (OAB) from the inception of the organisation in 1986, and became a trustee when the Board of Directors and the OAB merged in 1997. After 14 years of dedicated service, he retired from VERTIC's board in February 2000. •

Verification Quotes

"The challenge will be, as it is for any verification effort, proving the negative. The agency will have to redouble its efforts to verify not only that there are no undeclared nuclear materials or activities in Iran but that Iran is not carrying out any activities that are prohibited under the JCPOA (...)". Laura Rockwood, Executive Director, VCDNP, and former Section Head for Non-Proliferation and Policy Making in the IAEA Office of Legal Affairs, during the EU Non-Proliferation and Disarmament Conference 2015 Third Plenary Session, "The Iran Deal - Outcomes and Next Steps", 12 November 2015.

"(...) the longstanding divergence of views on the merits of a legally binding verification mechanism should not prevent States Parties from considering proposals of other ways to improve confidence in compliance. (...)". Statement by the International Committee of the Red Cross, Meeting of the States Parties to the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction, 14-18 December 2015, Geneva

"We've always said that this deal isn't based on trust: but rather on intense verification of Iran's programme. That's why we're working so closely with the IAEA, to make sure it has everything it needs, to do this crucial job." Dec. 17, 2015: Stephen D. Mull, Lead Coordinator for Iran Nuclear Implementation testifies before the Senate Foreign Relations Committee on 'The Status of JCPOA Implementation and Related Issues'.

"When fully implemented, the JCPOA will dramatically scale back Iran's nuclear programme, and provide unprecedented monitoring and verification tools to ensure that it is exclusively peaceful as it moves forward" Mr. Van Bohemen (New Zealand), UNSC meeting on Non-proliferation of weapons of mass destruction Briefing by the Chair of the Security Council Committee established pursuant to resolution 1540 (2004), 22 December 2015

Grants and administration

This December, VERTIC said goodbye to employee of five years, Yasemin Balci. Yasemin served on the National Implementation Measures team as a Senior Legal Officer. An invaluable contributor to the programme's work, Yasemin worked tirelessly on numerous technical assistance visits across the globe. We are sure she will go onto great things in her new position at the Dutch Ministry of Foreign Affairs.

VERTIC has also welcomed a new employee on the National Implementation Measures team, Giuseppe di Luccia, as a new Assistant Legal Officer. Giuseppe came to VERTIC as an intern, and has now taken on a short-term contract to assist with the programme's projects. He is a recent graduate of Johns Hopkins School of Advanced International Studies in Bologna. We look forward to working with him.

This January, VERTIC celebrates its thirtieth birthday. We would like to take this opportunity to thank the many people that have been involved with the organisation over the years. Here's to thirty more! •

building trust through verification

VERTIC is an independent, not-for-profit non-governmental organisation. Our mission is to support the development, implementation and effectiveness of international agreements and related regional and national initiatives, with particular attention to issues of monitoring, review, legislation and verification. We conduct research, analysis and provide expert advice and information to governments and other stakeholders. We also provide support through capacity building, training, legislative assistance and cooperation.

PERSONNEL Mr Andreas Persbo, *Executive Director*; Ms Angela Woodward, *Deputy Executive Director*; Mr Scott Spence, *Programme Director*; Mr Larry Mac-Faul, *Acting Programme Director, Editor-In-Chief for VERTIC publications*; Dr David Keir, *Principal Scientist*; Mr Hugh Chalmers, *Senior Researcher*; Dr Sonia Drobysz, *Senior Legal Officer*; Mr Russell Moul, *Researcher*; Mr Alberto Muti, *Researcher*; Ms Katherine Tajer, *Administrator/Research Assistant*; Mr Giuseppe di Luccia, *Associate Legal Officer*.

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Professor Colin McInnes; Professor Graham Pearson; Dr Arian L. Pregoner; Dr Rosalind Reeve; Dr Neil Selby; Minister Victor S. Slipchenko; Dr David Wolfe.

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